LESSON OVERVIEW

This lesson provides information on Evaluation Area 4, Field Measurement and Analysis.

Lesson Objectives

At the completion of this lesson, you will be able to:

- Identify the three elements to be evaluated under field measurement and analysis.
- Summarize the criteria used to evaluate field measurement and analysis.

OVERVIEW OF EVALUATION AREA 4

Evaluation Area 4, Field Measurement and Analysis, includes three sub-elements:

4.a Plume Phase Field Measurements and Analysis
4.b Post-Plume Phase Field Measurements and Sampling
4.c Laboratory Operations

Evaluation Frequency

The minimum frequency for evaluating the criteria under these sub-elements is as follows:

Sub-Elements	Minimum Frequency
4.a Plume Phase Field Measurements and Analysis	Every full-participation exercise
4.b Post-Plume Phase Field Measurements and Sampling 4.c Laboratory Operations	Once in 6 years

4.a PLUME PHASE

In the event of a nuclear power plant incident, the possible release of radioactive material may pose a risk to the nearby population and environment. Although accident assessment methods are available to project the extent and magnitude of a release, these methods are subject to large uncertainties.

During an incident, it is important to collect field radiological data to help characterize any radiological release. Adequate equipment and procedures are essential to such field measurement efforts.

Sub-element 4.a, Plume Phase Field Measurements and Analysis, assesses the ORO's capability to deploy field teams to perform those measurements. It includes three criteria:

Criterion 4.a.1: The field teams are equipped to perform field measurements of direct radiation exposure (cloud and ground shine) and to sample airborne radioiodine and particulates.

Criterion 4.a.2: Field teams are managed to obtain sufficient information to help characterize the release and to control radiation exposure.

Criterion 4.a.3: Ambient radiation measurements are made and recorded at appropriate locations, and radioiodine and particulate samples are collected. Teams will move to an appropriate low background location to determine whether any significant (as specified in the plan and/or procedures) amount of radioactivity has been collected on the sampling media.

4.a.1 Field Team Equipment

Field teams should be equipped with all instrumentation and supplies necessary to accomplish their mission. The instruments must be capable of:

- Measuring gamma exposure rates.
- Detecting the presence of beta radiation.
- Measuring a range of activity and exposure consistent with the intended use of the instrument and the ORO's plans and procedures.

Maintenance and Operability. All instruments should be operated, maintained, and calibrated in accordance with the manufacturer's recommendations. OROs should demonstrate verification of proper operational response for each instrument, according to specified standards.

4.a.2 Field Team Management

Criterion 4.a.2 requires that field teams be "managed to obtain sufficient information to help characterize the release and to control radiation exposure." OROs should demonstrate the capability to **brief teams before deployment** on predicted plume location and direction, travel speed, and exposure control procedures.

Field measurements are needed to help characterize the release and to support the implementation or modification of protective actions. Teams should be directed to take measurements at such times and locations that the needed information can be obtained.

Responsibility. If licensee field monitoring teams have accepted the responsibility to obtain peak measurements in the plume, with concurrence from OROs, State and local monitoring teams do not have to repeat these measurements. If the licensee teams do not obtain such measurements, it is the ORO's decision as to whether peak measurements are necessary to sufficiently characterize the plume.

Coordination. The sharing and coordination of plume measurement information among all field teams (licensee, Federal, and ORO) is essential. Coordination concerning transfer of samples, including a chain-of-custody form, to a radiological laboratory should be demonstrated.

OROs should use Federal and other resources if available. Evaluation of this criterion will take into consideration the level of Federal and other resources participating in the exercise.

4.a.3 Taking and Reporting Measurements

Criterion 4.a.3 focuses on the actual taking and reporting of measurements. It requires that "ambient radiation measurements are made and recorded at appropriate locations, and radioiodine and particulate samples are collected. Teams will move to an appropriate low background location to determine whether any significant (as specified in the plan and/or procedures) amount of radioactivity has been collected on the sampling media." The ORO must:

- Demonstrate the capability to take and report measurements and field data.
- Consider the need for expedited lab analysis for samples significantly above background levels.
- Share data in a timely manner with other OROs.

Methodology. The ORO's methodology must be in accordance with the ORO's plan and/or procedures. This applies to:

- Contamination control
- Instrumentation
- Preparation of samples
- Chain-of-custody form for transfer to a laboratory

4.b POST-PLUME PHASE

Sub-element 4.b, Post-Plume Phase Field Measurements and Sampling, evaluates the capability to assess the actual or potential magnitude and locations of radiological hazards in the ingestion pathway zone (IPZ).

This sub-element focuses on the collection of environmental samples for laboratory analyses that are essential for decisions on protection of the public from contaminated food and water and direct radiation from deposited materials, and for relocation, re-entry and return measures. This sub-element has one criterion:

> **Criterion 4.b.1:** The field teams demonstrate the capability to make appropriate measurements and to collect appropriate samples (for example, food crops, milk, water, vegetation, and soil) to support adequate assessments and protective action decision-making.

Measurements and Samples. To meet this criterion, the ORO's field team should demonstrate the capability to take measurements and samples, at such times and locations as directed, to enable an adequate assessment of the ingestion pathway and to support re-entry, relocation, and return decisions.

When resources are available, the use of aerial surveys and in-situ gamma measurement is appropriate.

Methodology and Sources. All methodology is to be in accordance with the ORO's plan and/or procedures. This includes methodology for contamination control, Instrumentation, preparation of samples, and chain-of-custody in transferring samples to a laboratory. Samples should be taken from appropriate sources:

- **Ingestion pathway samples** should be taken from agricultural products and water.
- **Samples in support of relocation and return** should be secured from soil, vegetation, and other surfaces in areas that received radioactive ground deposition.

Federal Resources. OROs should use Federal resources (e.g., DOE, EPA) and other resources if available. Evaluation of this criterion will take into consideration the level of Federal and other resources participating in the exercise. Links to Federal websites are provided at the end of this lesson.

4.c LABORATORY OPERATIONS

Sub-element 4.c, Laboratory Operations, assesses the capability to perform laboratory analyses of radioactivity in air, liquid, and environmental samples to support protective action decision-making. This sub-element includes one criterion:

> **Criterion 4.c.1:** The laboratory is capable of performing required radiological analyses to support protective action decisions.

Staff Capability. The laboratory staff should demonstrate appropriate procedures for:

- Receiving samples
- Preparing samples for conducting measurements
- Contamination control
- Radioanalytical techniques

Specific procedures to be demonstrated include:

- Logging of information
- Preventing contamination of the laboratory
- Preventing buildup of background radiation due to stored samples
- Preventing cross-contamination of samples
- Preserving samples that may spoil (for example, milk)
- Keeping track of sample identity

Laboratory Equipment. The laboratory should be appropriately equipped to provide analyses of media:

- As requested.
- On a timely basis.
- Of sufficient quality and sensitivity to support assessments and decisions as anticipated by the ORO's plans and procedures.

Instrument calibrations should meet specified standards.

Laboratory Methods. In analyzing typical radionuclides released in a reactor incident, the laboratory methods should be as described in the plans and procedures.

In analyzing atypical radionuclide releases (for example, transuranics or those resulting from a terrorist event), or when warranted by circumstances of the event, new or revised laboratory methods may be used. Analysis may require resources beyond those of the ORO.

Federal Resources. OROs should use Federal and other resources if available. Evaluation of this criterion will take into consideration the level of Federal and other resources participating in the exercise.